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I, JONNE YABSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003905884 for a patent by TERPSTRA ENTERPRISES PTY LTD as filed on 24 October 2003.

WITNESS my hand this
Sixteenth day of December 2003

JONNE YABSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

ORIGINAL

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Invention Title: "Extraction Apparatus"

The invention is described in the following statement:

"Extraction Apparatus"

Field of the Invention

This invention relates to an extraction apparatus and to a machine incorporating such extraction apparatus.

The extraction apparatus according to the invention has been devised particularly, although not solely, for use with a machine used to perform cutting and chasing operations on brickwork and masonry. The extraction apparatus may also be used to extract exhaust gas from other machinery powered by combustion engines, such as chainsaws and lawnmowers. Using this invention, the exhaust may be dispelled from environments where exhaust build-up may create hazardous working conditions.

Background Art

It is common to chase a groove or trench into brickwork and masonry to accommodate service lines such as electrical and other cabling, and water and gas supply lines. Typically, a chasing operation is performed using a machine having one or more cutting blades.

A significant amount of dust can be generated during a chasing operation, and water is often used for dust suppression. Typically, water is sprayed into the vicinity of the chasing operation, usually onto the cutting blade or blades.

The use of water for dust suppression precludes the use of electrical machinery such as electrical grinders that were previously a preferred option for performing chasing operations.

The inability to use electrical machinery requires that other sources of power be utilised. One suitable source of power is a machine driven by an internal combustion engine. Such a machine does, however, have a disadvantage in

that its exhaust gases are potentially dangerous and lethal, particularly when the machine is operated in confined areas.

It is against this background, and the difficulties and problems associated therewith, that the present invention has been developed.

Disclosure of the Invention

According to a first aspect of the invention there is provided an extraction apparatus for a machine having an internal combustion engine from which hot exhaust gases are discharged during operation thereof, the extraction apparatus comprising a body defining an outlet, an air inlet communicating with the outlet, flow means to induce flow from the inlet to the outlet, and an exhaust gas inlet communicating with the outlet, whereby in use there is confluence of incoming air and exhaust gas.

The confluence of the incoming air and the hot exhaust gas is advantageous in that contact of the air stream with the hot exhaust gas stream effects cooling of the exhaust gas.

The flow means may comprise a suction source connected to the outlet or a blower source connected to the inlet.

The air inlet may receive air from any appropriate source. The air may, for example, be ambient air from the environment in which the machine is operating or alternatively the air may be air extracted from a containment zone disposed about a tool operated by the engine. In the latter case, the air is likely to be accompanied by dust generated during operation of the tool, and possibly also water in circumstances where there is use of water for dust suppression.

Preferably, the body defines a flow passage leading to the outlet, with the air inlet and the exhaust gas inlet both opening onto the flow passage.

Preferably, the flow passage comprises an axial passage, with the air inlet being at one end thereof and the outlet being at the other end thereof, such that there is (in use) axial flow of air along the flow passage towards the outlet. The exhaust gas inlet is preferably arranged to deliver exhaust gas into the flow passage downstream of the air inlet. The exhaust gas inlet may be configured to deliver exhaust gas into the flow passage in a flow direction corresponding to the axial flow direction of the air.

There may also be provision for use of a cooling fluid, typically water. In this regard, the body may have provision for water flow in heat exchange relationship therewith for cooling purposes. For example, there may be a water jacket disposed about the passage for heat exchange contact therewith.

Additionally, or alternatively, there may be provision for injection of water into the flow passage to further assist cooling of the exhaust gas.

Where the apparatus does have provision for injection of water into the flow passage, there may be one or more water injection ports in the side wall of the flow passage. The or each injection port may receive water for injection from the water jacket in the body.

Water may be delivered to the apparatus by way of a flexible water delivery line. Water delivered in this may also be used for dust suppression where appropriate. The water may also filter the exhaust gas dissolving a portion of the exhaust therein.

The apparatus may incorporate a filter or scrubber for treating the exhaust gas before being dispelled. This may allow the hazardous components to be extracted from the exhaust gas before it is dispelled. It may even allow for the exhaust gas to be dispelled within the same environment without increasing the hazard to the operator. This may be particularly useful when the machinery is used in underground locations.

The outlet may be connected to the suction source by way of a suction hose. Cooling of the exhaust gas is needed, otherwise heat could cause damage to the suction hose and possibly also the suction source.

The suction hose and the water delivery line may be conveniently connected together for handling as a single unit. This may be achieved by accommodating the fluid delivery line in the suction hose for at least part of the length thereof.

In the alternative situation, the inlet may be connected to the blower source by way of a blower hose. As the blower hose is connected to the inlet, there is no risk of damage due to hot exhaust gases.

The extraction apparatus according to the invention may be provided as a discrete unit that can be fitted to a machine designed for performing cutting and chasing operations. Additionally, the extraction apparatus according to the invention can be incorporated as an integral part of a machine; for example, it may be incorporated as a feature of a new machine or retro-fitted as an attachment to an existing machine.

According to a second aspect of the invention there is provided a machine having an internal combustion engine from which hot exhaust gases are discharged during operation thereof, the machine further having extraction apparatus according to the first aspect of the invention.

According to a third aspect of the invention, there is provided a machine for performing a working operation on a workpiece, the machine comprising a tool receiving means for receiving a tool for performing the working operation, an internal combustion engine operable to drive the tool, the engine having an exhaust through which exhaust gas is discharged during operation, a body defining an outlet for connection to a suction source, the outlet being connected for fluid communication with the engine exhaust, and an air inlet connected for fluid communication with the outlet, whereby in use there is confluence of incoming air and exhaust gas.

When a blower source is used in place of the suction source, the blower source may be connected to the air inlet.

The machine may further comprise means for delivering water into the vicinity of the tool for suppression of dust generated thereby, a shroud disposed about the tool for containment of the dust and also the dust suppression water, and an extraction line communicating at one end thereof with the shroud and at the other end thereof with the air inlet, for extracting dust and dust suppression water carried by air drawn into the shroud and conveyed to the air inlet under the influence of the suction source or blower source.

Brief Description of the Drawings

The invention will be better understood by reference to the following description of several specific embodiments thereof as shown in the accompanying drawings in which:

Figure 1 is a schematic, sectional side elevational view of an extraction apparatus according to a first embodiment;

Figure 2 is a plan view of the apparatus of figure 1; and

Figure 3 is a side elevational view of an extraction apparatus according to a second embodiment.

Best Mode(s) for Carrying Out the Invention

Referring to Figures 1 and 2 of the drawings, there is shown an extraction apparatus 10 according to a first embodiment. The apparatus 10 is an attachment for a cutting machine (not shown) for performing cutting and chasing operations on wall and floor surfaces.

The cutting machine typically comprises a work head and a body carrying the work head. The body incorporates a drive unit in the form of an internal combustion engine (typically a petrol engine) having an exhaust line.

The drive head receives and supports a cutting tool, typically in the form of a cutting blade. A shroud is mounted onto the drive head about the cutting blade. The shroud encloses part of the cutting blade and has an opening beyond which the cutting blade extends. The purpose of the shroud is to contain the dust and, if water is used for dust suppression, to also contain slurry generated by the water used to suppress the dust.

The apparatus 10 comprises a body 11 having a tubular portion 13 defining a central flow passage 15. The flow passage 15 extends axially between two ends, at one of which there is provided an air inlet 17 and at the other of which there is provided an outlet 19. The outlet 19 is adapted for connection to one end of a suction hose (not shown), the other end of the suction hose being adapted for connection to a suction source such as a vacuum pump.

The body 11 further comprises an exhaust gas inlet 21 having an intake end 23 and a discharge end 25. The intake end 23 is adapted for connection to the exhaust line of the engine, and a coupling 27 is provided for that purpose. The exhaust gas inlet 21 is so configured that the discharge end 25 is centrally located within the flow passage 15 as well as opening onto the flow passage 15 in the direction towards the outlet 19.

With the arrangement of the air inlet 17 and the exhaust gas inlet 21, there is confluence (in the flow passage 15) of incoming air and exhaust gas. The incoming air and exhaust gas streams combine in the flow passage 15 and exit through the outlet 19 as a common stream flowing along the suction hose under the influence of the vacuum pump.

The confluence of the incoming air and the hot exhaust gas streams is advantageous in that contact of the cooler air stream with the hot exhaust gas stream effects cooling of the exhaust gas. Additionally, the cooler air dilutes the

hot exhaust gas, and the temperature of the resultant combined air/exhaust gas stream is lower than that of the exhaust gas alone.

The body 11 has provision for water flow in heat exchange relationship therewith for cooling purposes. Specifically, the body 11 incorporates a water jacket 31disposed about the flow passage 15. Water flows through the water jacket 31 between a water inlet 33 and a water outlet 35. The water inlet 33 and water outlet 35 are connected into a flexible water delivery line (not shown). Water leaving the outlet 35 can be conveyed away and discarded, or alternatively used for other purposes such as dust suppression at the shroud (in the case where the machine has a dust suppression facility).

There is also provision for injection of water into the flow passage 15 to further assist cooling of the hot exhaust gas. In this embodiment, water is injected into the flow passage 15 through an injection port 37 adapted to receive water for injection from the water jacket 31 in the body 11. The injection port 37 is provided in the side wall 39 of the flow passage at a location upstream of the discharge end 25 of the exhaust gas inlet 21. The location of the injection port 37 relative to the discharge end 25 is intended to reduce any possibility of injected water entering the exhaust system of the engine in the event of the engine not being operational while water injection is occurring.

The injected water is conveyed along the flow passage 15 to the outlet 19 and then along the suction hose, together with the air and exhaust gas.

The provision of cooling for the exhaust gas using water may be selective, in that apparatus 10 may be operated either with, or without, the delivery of water to the water jacket 31 for heat exchange and water injection. This can be controlled by a suitable control valve (not shown) in the water supply line.

In addition to creating fluid flow along the flow passage 15 as well as the suction hose, the suction effect provided by the vacuum pump may also provide noise suppression for the cutting machine.

The apparatus 10 can be operated with the air inlet 17 opening directly to atmosphere at the location where the machine is being used. In other words, air is drawn directly into the flow passage 15 through the air inlet 17 under the influence of suction created by the vacuum pump.

The apparatus 10 can be operated in another way, where the air inlet 17 is connected to the shroud of the cutting machine so as to communicate with the containment zone defined within the shroud. With this arrangement, air is drawn from within the containment zone. The air is likely to be accompanied by dust generated during operation of the tool, and possibly also water and/or slurry in circumstances where there is use of water for dust suppression. There may be a filtering process performed at the vacuum pump to filter the slurry and solid particles from the air and exhaust gas. The vacuum pump may have a discharge line through which the filtered air and exhaust gas are discharged to atmosphere.

Referring now to figure 3, there is shown apparatus 10 according to a second embodiment. As the second embodiment is similar in many respects to the first embodiment, corresponding reference numerals are used to denote similar parts. The second embodiment is different from the first embodiment in that it is designed for operation with a larger cutting machine. The second embodiment incorporates two water jackets 31 about the flow passage 15, each having an injection port 37 associated therewith. Additionally, there is a water jacket 41 about the exhaust gas inlet 21 to further assist cooling of the exhaust gas and the body 11 generally.

It should be appreciated that the scope of the invention is not limited to the scope of the embodiments described.

While the embodiments have been described in relation to a machine for performing chasing and cutting operations, it should also be understood that the invention might be utilised for machines having tools other than cutting blades, such as for example drilling tools and grinding tools.

Further, the invention may be used with any machine having an engine generating hot exhaust gases that need to be cooled and conveyed away from the location at which the engine is operating.

The extraction apparatus according to each embodiment is a discrete unit that is designed to be fitted as an attachment to an existing machine. It should be understood that the extraction apparatus according to the invention could be incorporated as an integral part of a machine; for example, it may be incorporated as a feature of a new machine or retro-fitted as an attachment to an existing machine.

Improvements and modifications may be incorporated without departing from the scope of the invention. For instance, a blower source may be connected to the inlet to induce flow rather than requiring a suction source to be connected to the outlet.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Dated this Twenty Fourth day of October 2003.

Terpstra Enterprises Pty Ltd
Applicant

Wray & Associates
Perth, Western Australia
Patent Attorneys for the Applicant

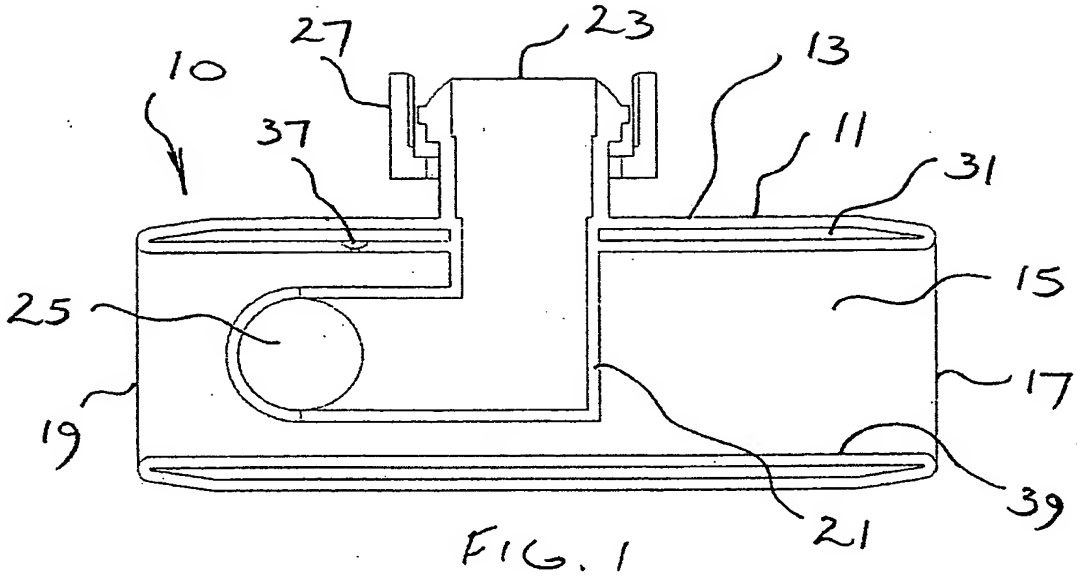

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FIG. 1

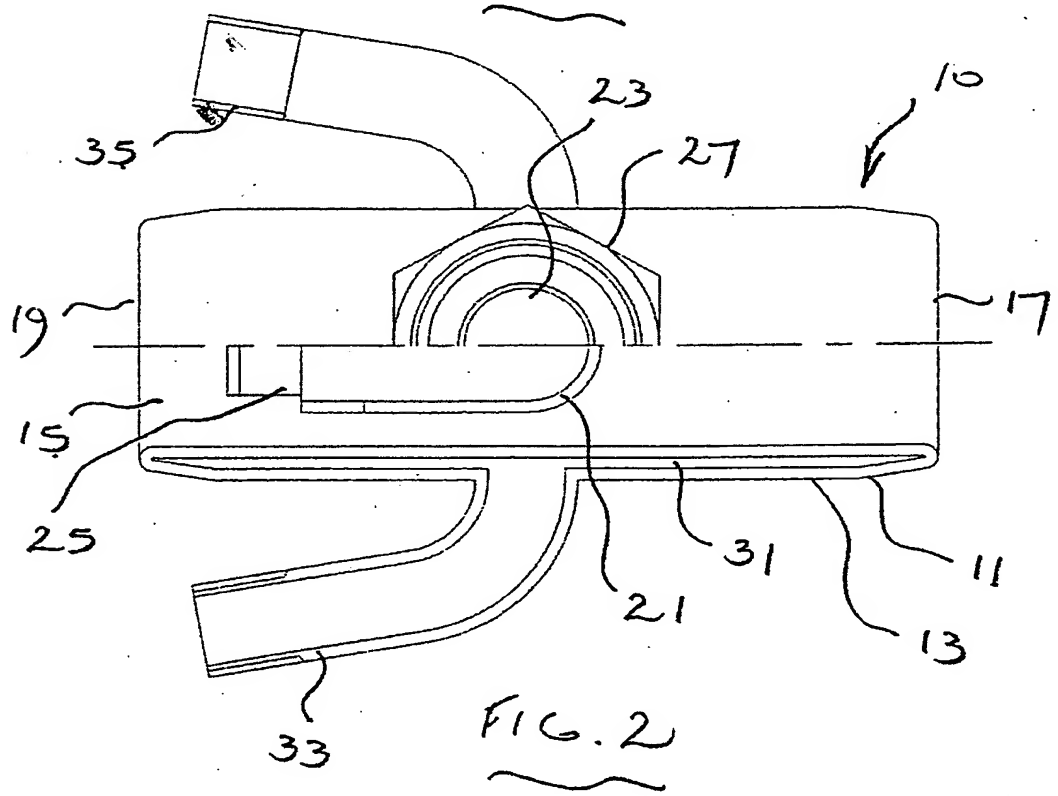

FIG. 2

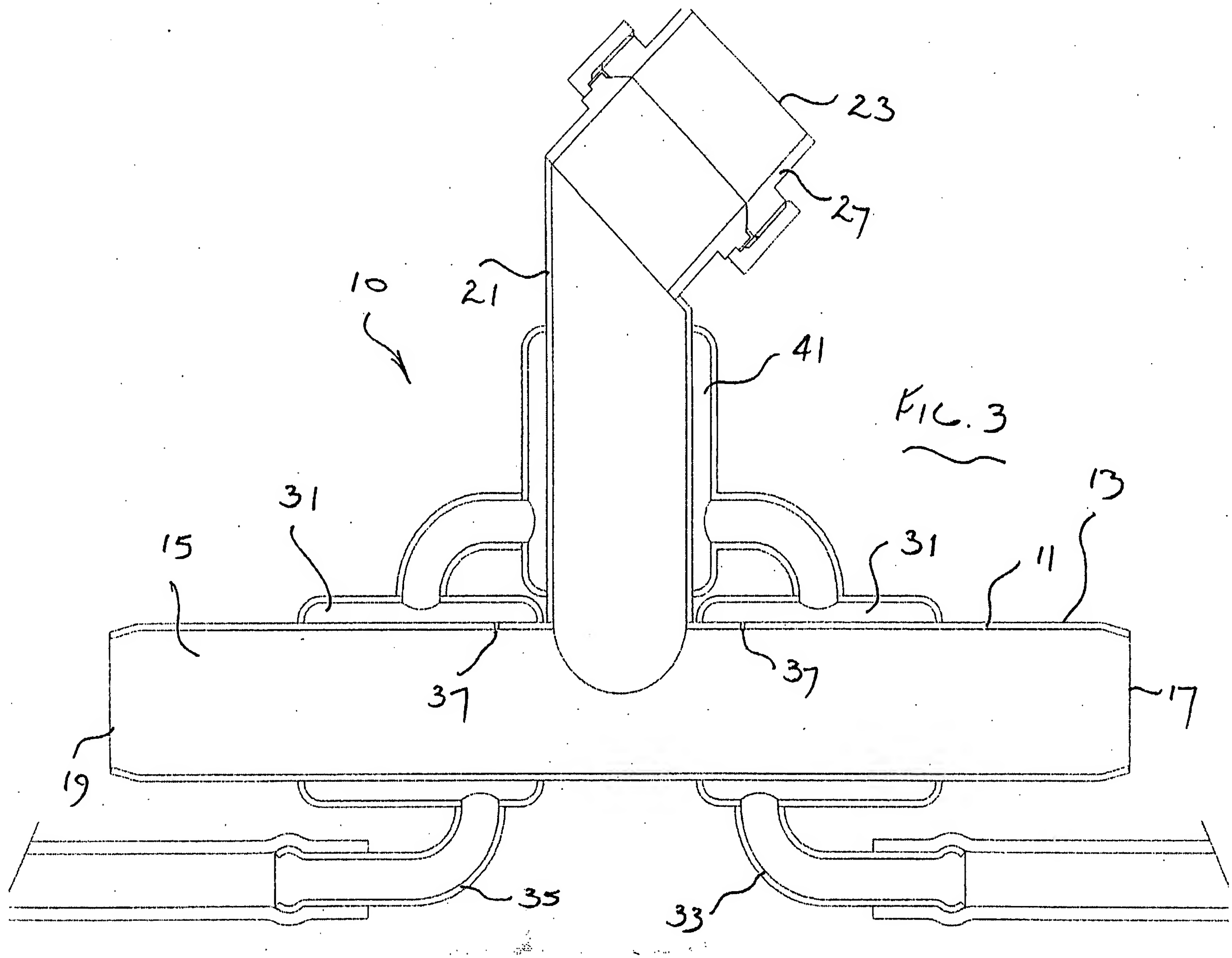

FIG. 3